DETERMINATION OF BEAM REACTIONS USING "EXCEL"

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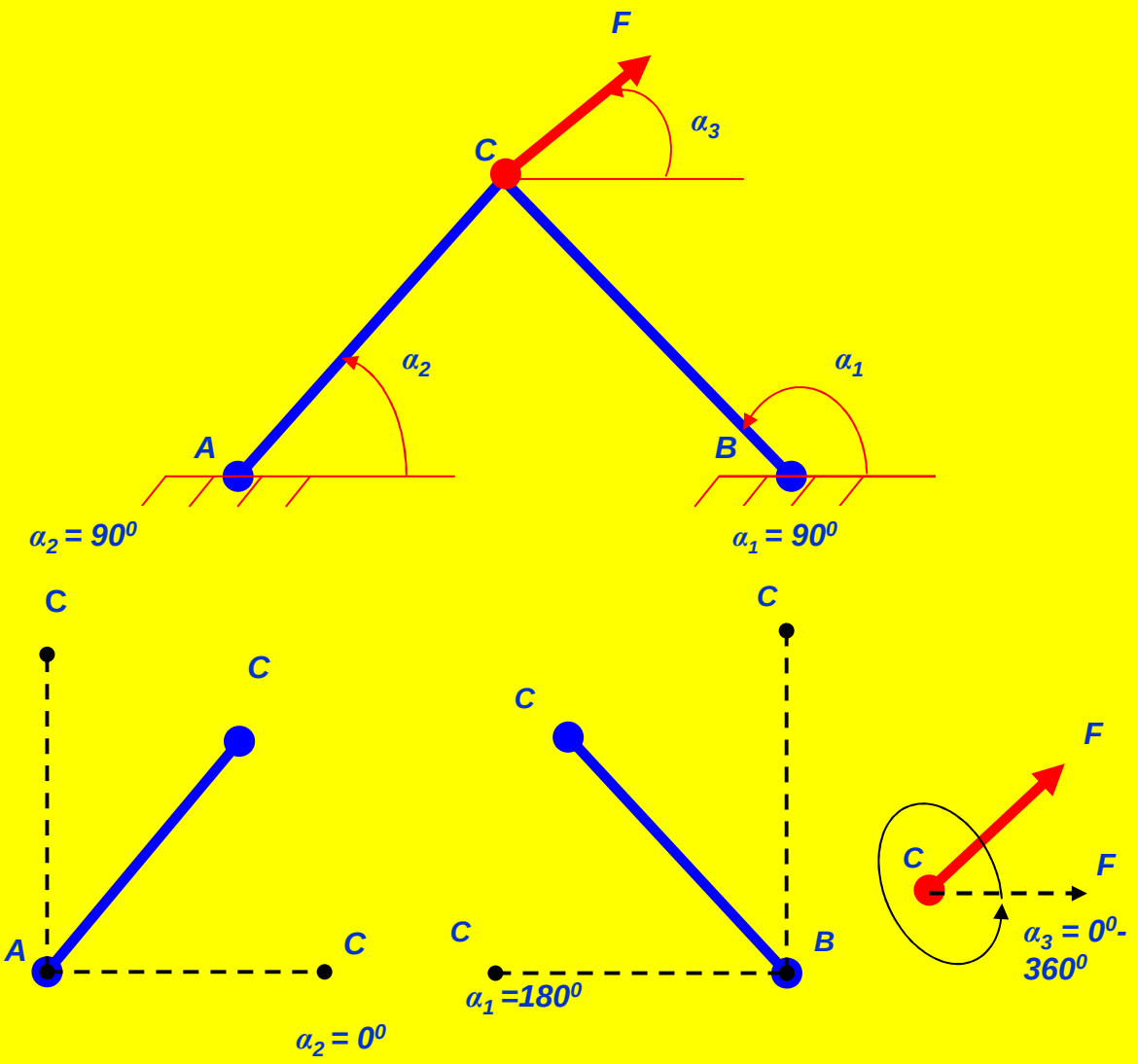
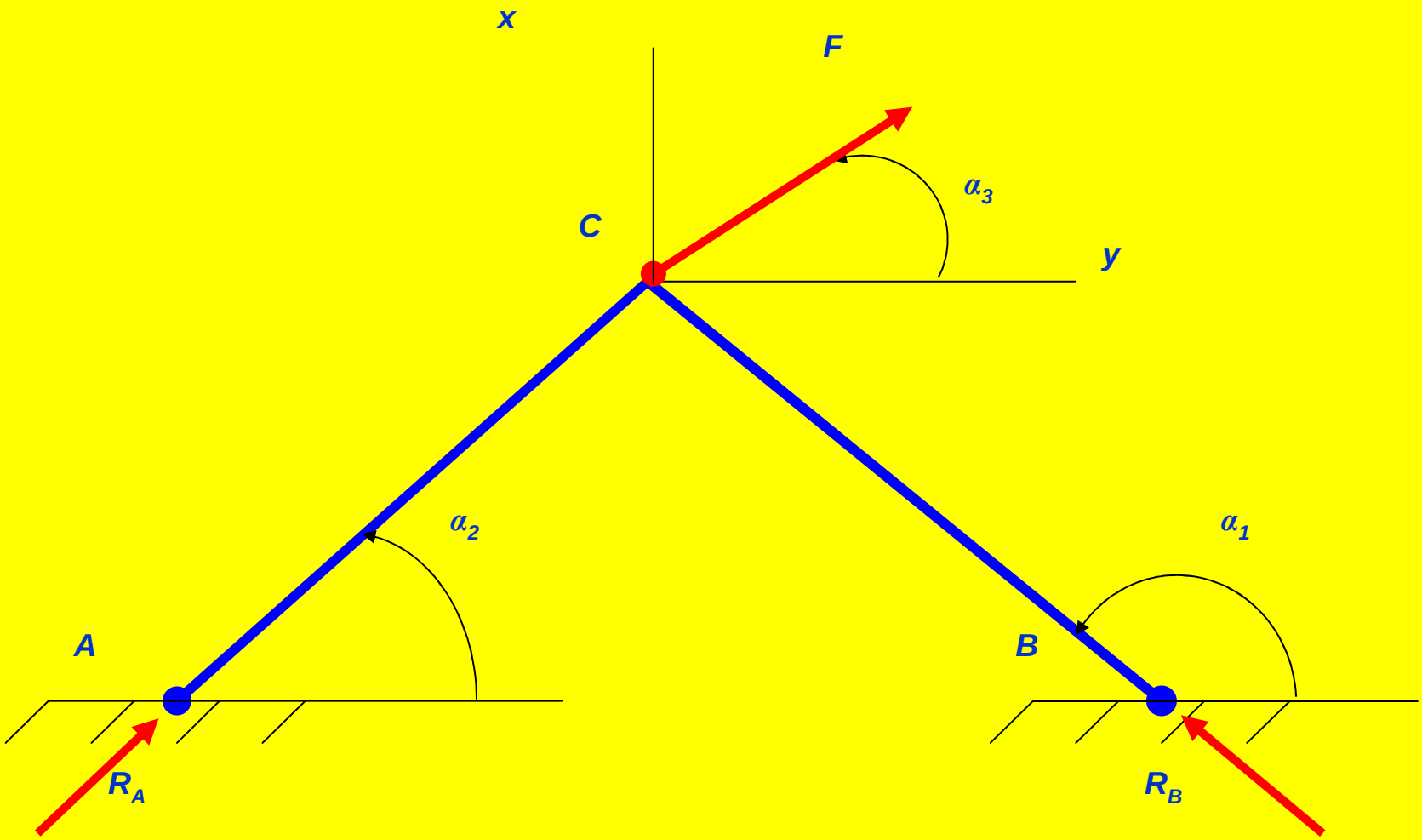
Task model


F
α_3
C
α_2
α_1
A
B
$\alpha_2 = 90^0$
$\alpha_1 = 90^0$
C
C
A
C
$\alpha_2 = 0^0$
C
C
C
B
$\alpha_1 = 180^0$
F
C
F
$\alpha_3 = 0^0$-
360^0

Tasks of computional scheme



Equations

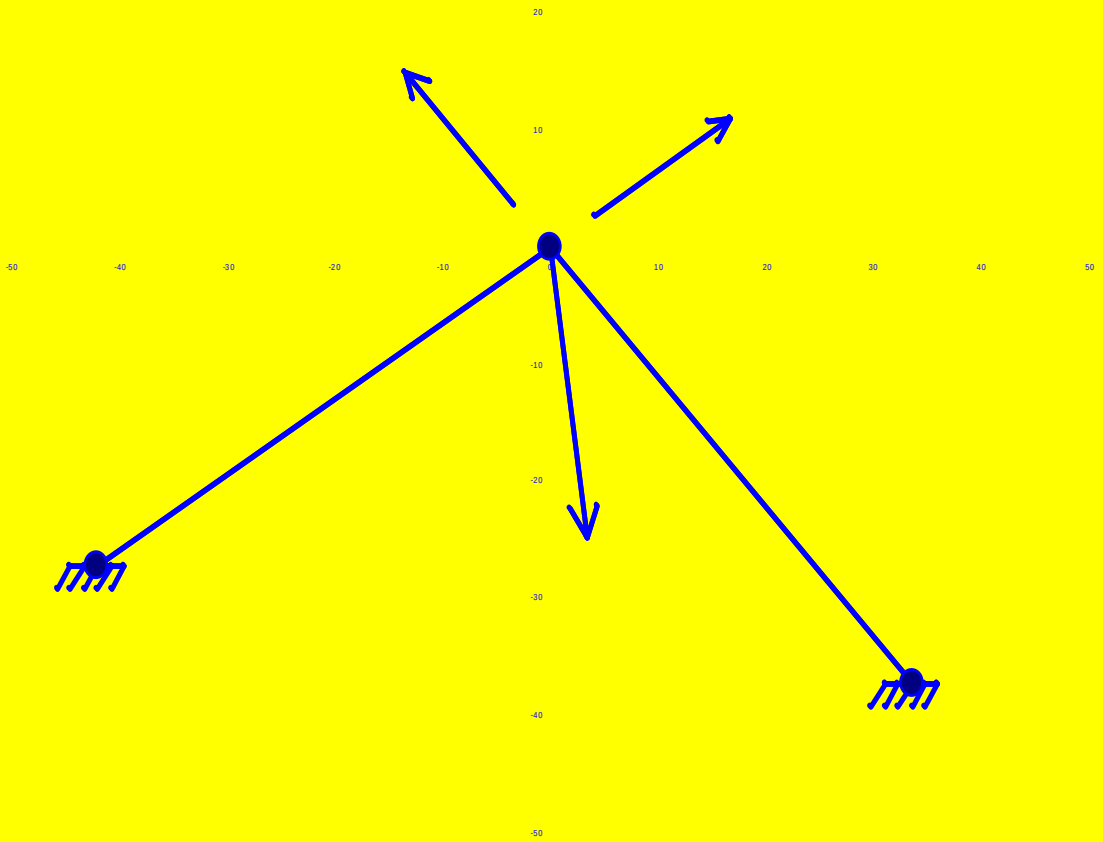
$$\Sigma F_x = 0, \quad R_B * \cos\alpha_1 + R_A * \cos\alpha_2 + F * \cos\alpha_3 = 0 \ (1)$$

$$\Sigma F_y = 0, \quad R_B * \sin\alpha_1 + R_A * \sin\alpha_2 + F * \sin\alpha_3 = 0 \ (2)$$

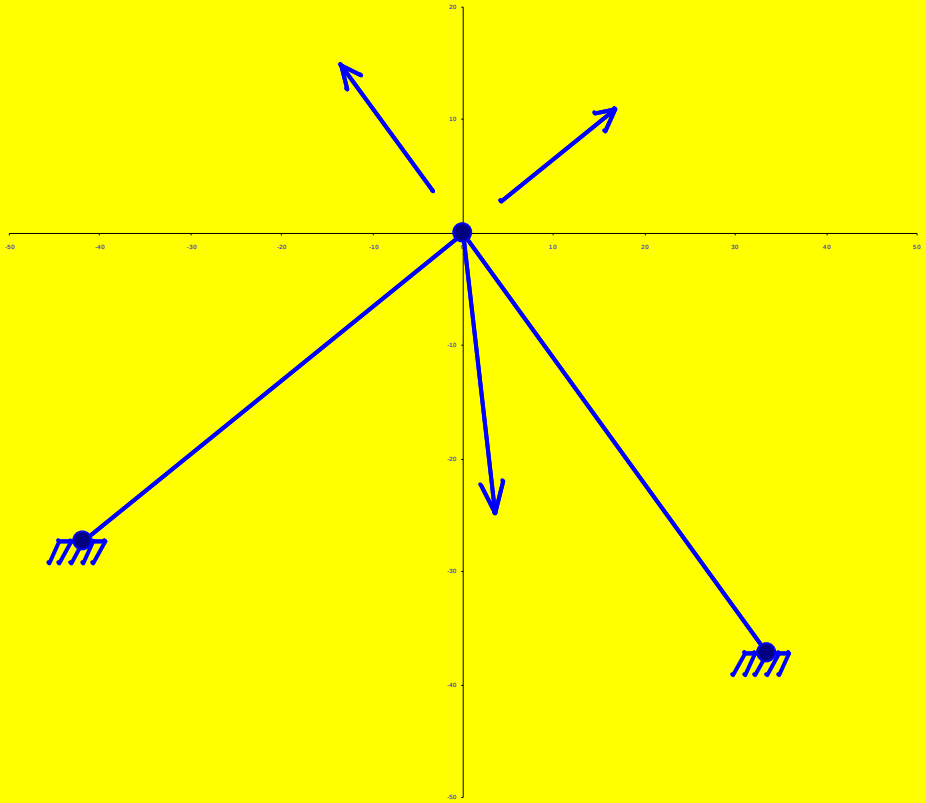
$$R_B = (-1) * \ (R_A * \cos\alpha_2 + F * \cos\alpha_3 \ ) / \cos\alpha_1 \ (3)$$

$$R_A = F * (\cos\alpha_3 * \mathrm{tg}\alpha_1 - \sin\alpha_3) / (\sin\alpha_2 - \cos\alpha_2 * \mathrm{tg}\alpha_1) \ (4)$$

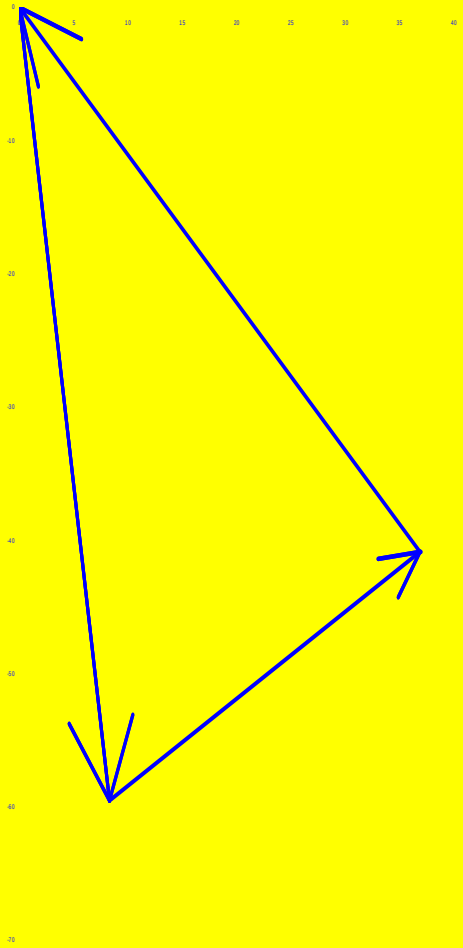
Task calculation scheme with free directions



Task scheme with correct directions



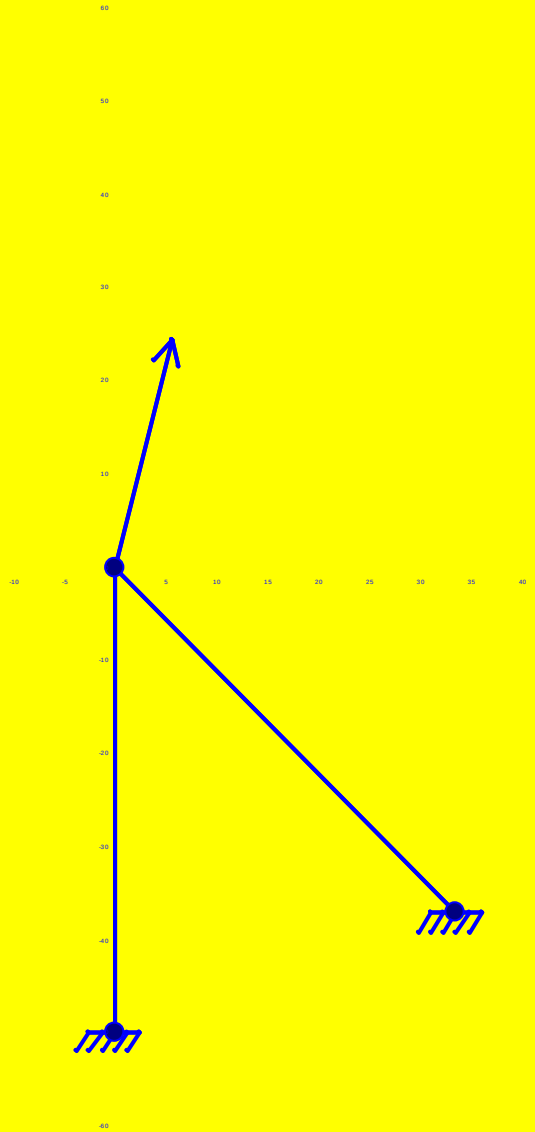
Triangle of forces



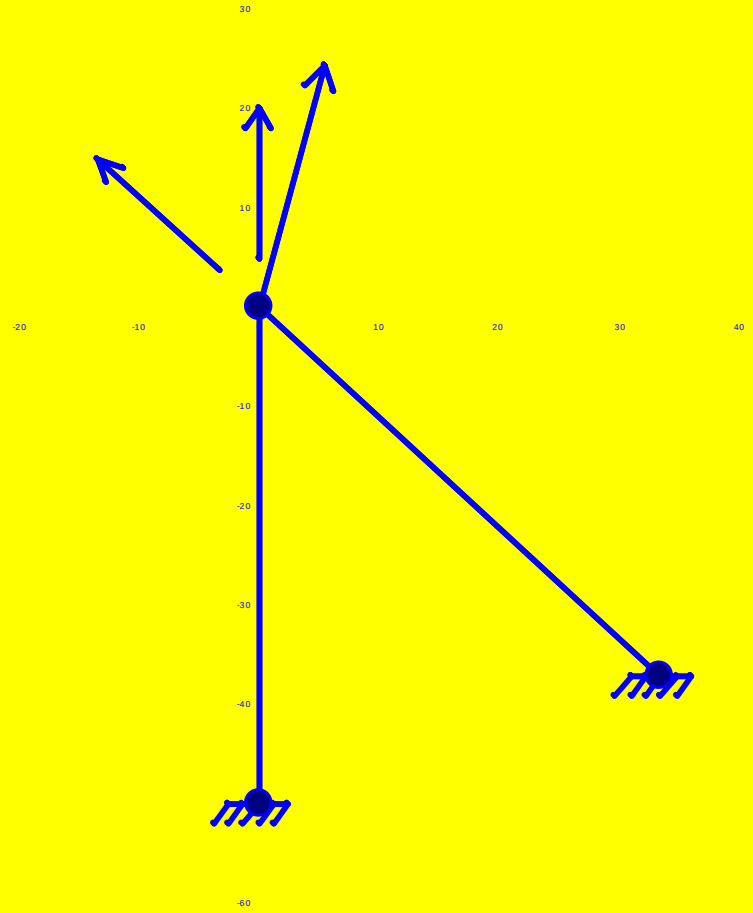
Data of tables contents

Data					Calculations				Directs	
Ex.	F	a_1	a_2	a_3	R_A	R_B	Cx	Cy	R_A	R_B
no.	kN	degrees	degrees	degrees	kN	kN	kN	kN		
E2	59	132	90	798	-72,2	19,8	0	0	opposite	actual

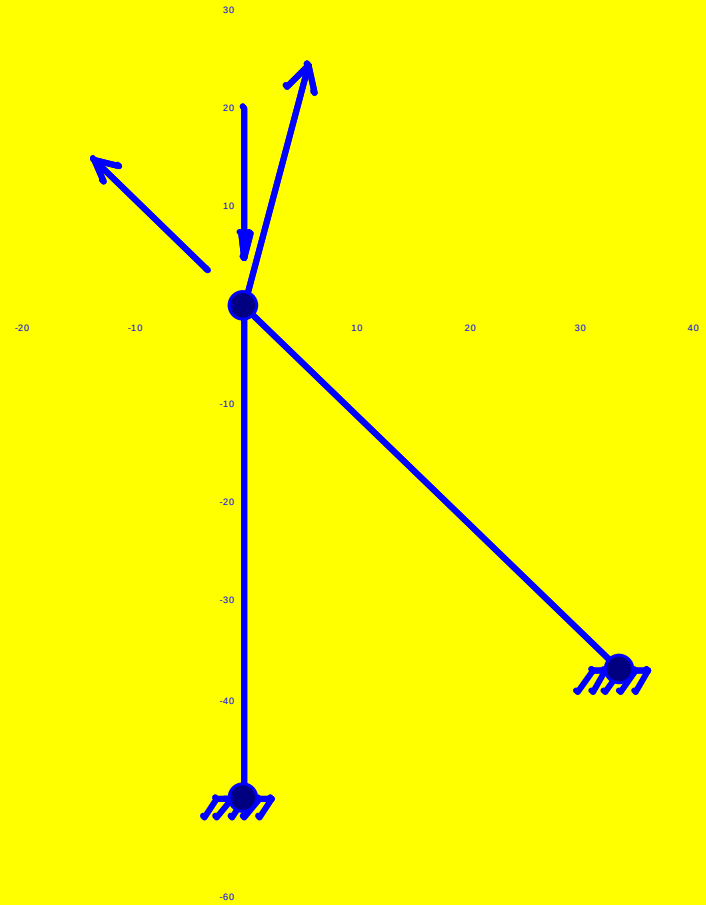
Task calculation scheme



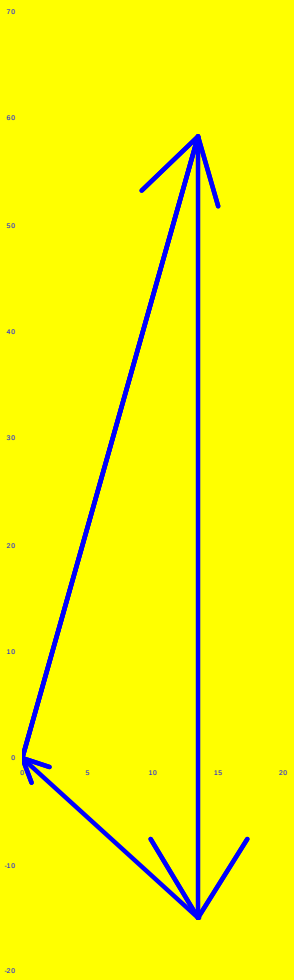
Task calculation scheme with free directions



Task calculation scheme with correct directions



Task scheme of graph solutions



Conclusions:

1. Provided examples prove that this methodology allows flexible modelling of basic/general model, starting from the simplest and moving towards more complicated assignments as well as. It (methodology) also provides possibility to choose directions of the loadings changing their inclination angles from 0 to 360 degrees.

2. Two ways of a task solution are possible:

a) Using figures from a table of initial data, to calculate and draw a scheme manually/on paper and compare it with computer-aided solution.

b) Using different modelling variants, to model correctly a table of data (applying the same scheme) and get the same computer-aided solution.

3. Application of IT helps to save time and leads to a better quality of tasks of statically determinate system of beam.

4. This methodology requires both a student and a teacher to possess specific knowledge and skills in the fields of mechanics and informational technologies.

Thanks for attention